PATENT SPECIFICATION

664,410

Date of Application and filing Complete Specification : Nov. 11, 1948.

No. 29317/48.

Application made in United States of America on Nov. 19, 1947.

Complete Specification Published : Jan. 9, 1952.

Index at acceptance :—**Classes 83(ii)**, A83 ; **and 83(iv)**, T2(c : i), T(3 : 6).

COMPLETE SPECIFICATION

Improvements in or relating to Welding

We, FIRESTONE TYRE & RUBBER COMPANY LIMITED, a British Company, of Great West Road, Brentford, Middlesex (Assignees of MAX OTTO KUHN), do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement :—

This invention relates to a method of fusion welding a continuous seam between telescoping cylindrical members of light gauge metal.

Heretofore, in the production of various articles for containing food or other consumable articles, various types of welded constructions have been proposed. For example, in the construction of milk cans, beverage containers, and the like, the containers are conventionally manufactured by forming a sleeve-like body portion and butt welding suitable dished end caps thereon. Such containers are frequently constructed of low carbon steel and finished by a hot tin dip. Tin coatings thus applied frequently wear off or are worn off as the result of repetitive cleaning operations necessitating periodic retinning. To avoid these retinning operations while maintaining the desired non-corrosive properties, employment of stainless steel has been suggested. However, the current cost of stainless steel dictates certain deviation from conventional construction practices. For example, reduction of the wall gauge of the container forming material has made it impractical to use butt welds between the end portions and the body of the container. Marginal reinforcement is desirable with the use of thin gauge material. Welded joints or connections, employed with marginal reinforcements, such as beads, have been difficult to form in a rapid, economical manner to produce a non-corrosive surface.

The general object of the present invention is to avoid and overcome the foregoing and other problems in and disadvantages of prior methods of forming welded joints and to provide an effective, positive method of obtaining satisfactory welded joints, as applied to containers of light gauge metal.

[*Price*

Another object of the invention is to locate, positivcly, the weld area in securing an end cap to a tubular article.

A further object of the invention is to avoid the formation of crevices or laps in securing an end cap to a tubular article, and to position such end cap normal to the longitudinal axis of the tubular article.

Another object of the invention is to provide such a welding method capable of giving consistently satisfactory results under production conditions.

A further object of the invention is to provide an improved continuous method of fusion welding the abutting surfaces of two light gauge telescoping cylindrical members.

According to the invention there is provided a method of fusion welding the components of a thin gauge sheet metal vessel, which comprises inserting an end closure member into an open-ended cylinder in abutment with an annular shoulder rolled in the wall of the cylinder, and applying welding heat to the exterior surface of said wall adjacent the area of the shoulder to fuse the cylinder and closure member together.

The invention also resides in a method of fusion welding the components of a thin gauge sheet metal vessel, which comprises forming a cylinder from metal sheeting, rolling an annular shoulder into the outer wall of the cylinder by compressing a localized portion thereof, forming an end closure member, inserting the closure member into the cylinder in abutment with said shoulder, and applying welding heat to the outer wall of the cylinder in the recessed area thereof to fuse the cylinder and closure member together.

The invention further resides in a method of fusion welding two telescoping cylindrical thin gauge sheet metal members which comprises rolling a groove into one of the members to form a circumferentially extending shoulder projecting from the circumferential surface thereof, the shoulder having an annular surface extending at substantially right angles to the axis of said member and

joining with said circumferential surface to form a sharp corner therewith, assembling the members with the end edge of the one member abutting the annular surface of the other member and fitting snugly within said corner, and applying welding heat to the members adjacent the groove, thereby causing said shoulder and end edge member to weld by fusion to form a substantially smooth continuous weld surface between the two members.

There is also provided by the invention a thin gauge sheet metal container comprising a cylindrical body part and an end part adapted to close one end thereof, said end part having a cylindrical portion adapted to have telescoping engagement with said body, one of said parts having an annular circumferentially extending shoulder projecting from the surface adjacent one end thereof, said shoulder having a surface extending at substantially right angles to the said one part and defining a sharp corner therewith, the other part having its end edge abutting said surface and fitting snugly within said corner, whereby when said parts are welded by the application of welding heat adjacent said shoulder said abutting surfaces will fuse together to form a smooth weld surface.

In order that the invention may be clearly understood and readily carried into effect the same will now be described more fully with reference to the accompanying drawings, in which :—

Fig. 1 is an exploded view, in longitudinal section, of various segments of an article to be welded together in accordance with the principles of the invention ;

Fig. 2 is a longitudinal section of a container ready for welding in accordance with the principles of the invention ; and

Fig. 3 shows in longitudinal section a partially fabricated container being processed in accordance with the invention ;

As best shown in Fig. 1, a tubular body portion 10 has cap-like end closures 11 and 12, adapted, when joined, to form a container. Body 10 may be formed from flat stock rolled to form a cylinder and marginally bonded to define a longitudinal seam. Cylindrical body 10 is provided with annular recesses 13 and 14, of any desired contour and rolled into the cylinder wall adjacent the ends thereof. End caps 11 and 12 are of a size to be telescoped into the ends of cylinder 10, in pressed fit engagement therewith, to seat against annular shoulders 13a and 14a, defined by recesses 13 and 14, as shown in Fig. 2.

One of the features of the invention is that a continuous walled article, the article 10, is to be fusion welded to the end portion of a separate article, such as one of the end caps 11 and 12, which is in tight engagement with the inner surface of the article 10. Assembly of the units to be welded in this manner ensures a fusion weld wherein the weld arc or other source of heat may be applied to a localized zone of the cylinder on the outer wall surface to effect heat of fusion, by conduction at the abutting surfaces of the end cap margins and the faces of the annular shoulders, to form a smooth welded bond devoid of crevices or laps, and productive of a smooth overall surface.

With reference to Fig. 3, a fusion welded joint is shown formed between the end cap 11 and the article 10, and a similar joint is shown being formed between the end cap 12 and the article. End cap 12 is provided with aperture 15 centrally thereof, for the ultimate receipt of a plug or other closure member, aperture 15 being utilized, during welding, for the extension into the container of conduit 16, positioned to extend at right angles to the axis of the container body 10 to a point adjacent the margin of end cap 12. A companion conduit 17 extends to a point adjacent the outer surface of cap 12 at the crown thereof. Conduits 16 and 17 connect to a source of an inert or reducing gas so that an inert or reducing atmosphere may be established at the area of weld interiorly of the container. Welding is achieved by means of a conventional welding nozzle 18 supplying welding heat, for example a welding arc produced from an electrode 19 positioned immediately adjacent channel 14, a conventional ground lead 20 completing the circuit. A pair of chill rings 21 and 22 are telescoped over body portion 10 and positioned adjacent each side of the recess 14 for the purpose of confining heat, rings 21 and 22 having sufficient volume of metal therein effectively to withdraw a large quantity of heat from body 10 and end cap 12 to prevent excessive heating of any large areas. Body portion 10 is rotated with relation to the weld head 18 at a speed to prevent the surfaces defining annular channel 14 from being burned through, but sufficient fluidity of the material is achieved to effect a fusion between cap 12 with the metal originally forming channel 14, since mechanical pressure cannot be applied to the weld being produced, due to space limitations. Welding must be effected by heating the associated surfaces to a sufficient temperature to achieve the desired tight, continuous bonding action as the surfaces move past electrode 19 to cause body 10 to " pick up " the end cap as the cap margin is rendered plastic by the weld heat.

The welding method disclosed herein results in fluid-tight bonds between metal surfaces without the application of any external metal thereto. Since only the metal of the abutting surfaces is caused to fuse together, a smooth joint, free of crevices

and rough spots common in conventional welded joints, results. The joint is therefore ideal for employment in containers adapted to contain edible material and to receive frequent workings. The weld action is achieved without the use of any reinforcing or pressure members within the container and it provides an excellent welding process for effecting a circumferentially extending weld on cylindrical members. The method is applicable to other uses during manufacturing processes wherein a smooth and easily cleanable joint is desired.

It will be understood that the invention is not limited to the specific example set forth since modification may be resorted to within the scope of the appended claims.

HAVING NOW particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is :—

1. A method of fusion welding the components of a thin gauge sheet metal vessel, which comprises inserting an end closure member into an open-ended cylinder in abutment with an annular shoulder rolled in the wall of the cylinder, and applying welding heat to the exterior surface of said wall adjacent the area of the shoulder to fuse the cylinder and member together.

2. A method of fusion welding the components of a thin gauge sheet metal vessel, which comprises forming a cylinder from metal sheeting, rolling an annular shoulder into the outer wall of the cylinder by compressing a localized portion thereof, forming an end closure member, inserting the closure member into the cylinder in abutment with said shoulder, and applying welding heat to the outer wall of the cylinder in the recessed area thereof to fuse the cylinder and closure member together.

3. A method according to claim 1 or 2, in which the closure member is maintained in pressed fit engagement with the inner wall of the cylinder.

4. A method according to any one of the preceding claims, in which the closure member is cup-shaped.

5. A method according to any one of the preceding claims, in which the closure member is provided with a centrally disposed aperture, and a conduit for discharging inert gas on the welding area is projected through said aperture.

6. A method according to any one of the preceding claims, in which a closure member is secured in position at each end of the cylinder in a similar manner.

7. A method of fusion welding two telescoping cylindrical thin gauge sheet metal members which comprises rolling a groove into one of the members to form a circumferentially extending shoulder projecting from the circumferential surface thereof, the shoulder having an annular surface extending at substantially right angles to the axis of said member and joining with said circumferential surface to form a sharp corner therewith, assembling the members with the end edge of one member abutting the annular surface of the other member and fitting snugly within said corner, and applying welding heat to the members adjacent the groove, thereby causing said shoulder and end edge member to weld by fusion to form a substantially smooth continuous weld surface between the two members.

8. A method according to any one of the preceding claims, in which the members are rotated while heat is applied to effect a continuous weld.

9. A method according to any one of the preceding claims, in which oxygen is excluded from the inner surface of the welded area, e.g., by supplying an inert gas adjacent to the welded area.

10. The method of fusion welding two members substantially as hereinbefore described.

11. A fusion-welded structure whenever made by a method according to any one of the preceding claims.

12. A thin gauge sheet metal container comprising a cylindrical body part and an end part adapted to close one end thereof, said end part having a cylindrical portion adapted to have telescoping engagement with said body, one of said parts having an annular circumferentially extending shoulder projecting from the surface adjacent one end thereof, said shoulder having a surface extending at substantially right angles to the said one part and defining a sharp corner therewith, the other part having its end edge abutting said surface and fitting snugly within said corner, whereby when said parts are welded by the application of welding heat adjacent said shoulder said abutting surfaces will fuse together to form a smooth weld surface.

Dated the 11th day of November, 1948.

For :
FIRESTONE TYRE & RUBBER COMPANY LIMITED.
STEVENS, LANGNER, PARRY & ROLLINSON,
Chartered Patent Agents,
5–9, Quality Court, Chancery Lane,
London, W.C.2,
and at
120, East 41st Street, New York, 17, N.Y., U.S.A.

Redhill : Printed for His Majesty's Stationery Office, by Love & Malcomson Ltd.—1952.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies, price 2s. per copy ; by post 2s. 1d. may be obtained.

SHEET 1

Fig. 1.

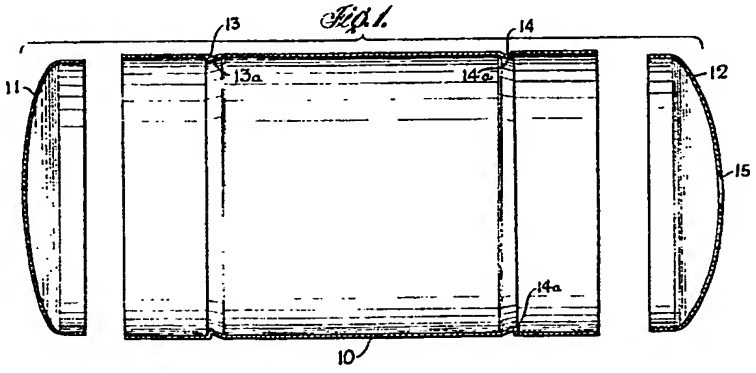
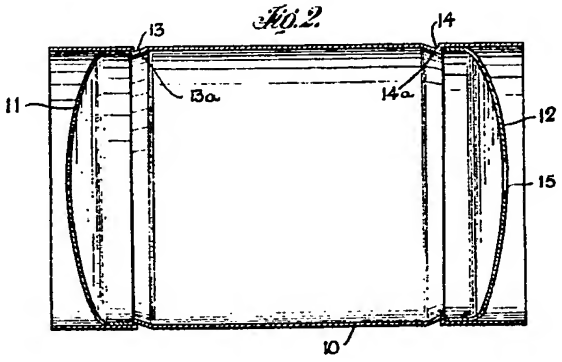
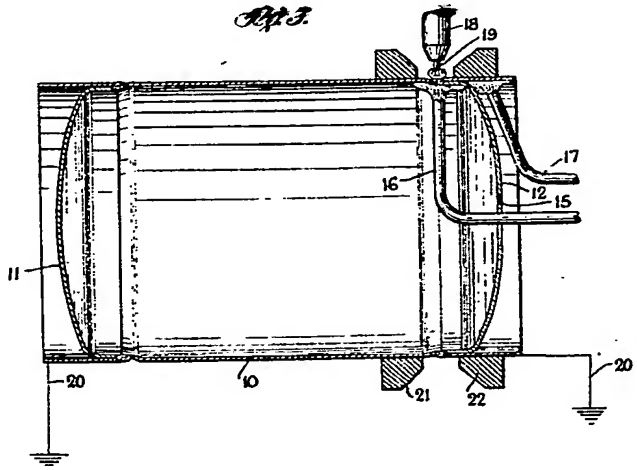


Fig. 2.



SHEET 2

Fig. 3.



H.M.S.O. (M.F.P.)